COMMISSION INTERNATIONALE DE L'ÉCLAIRAGE
INTERNATIONAL COMMISSION ON ILLUMINATION
INTERNATIONALE BELEUCHTUNGSKOMMISSION

DIVISION 2 : PHYSICAL MEASUREMENT OF LIGHT AND RADIATION

Home Page: http://nml.csir.co.za/~cie2

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August 31, 1999

Minutes of CIE Division 2 Meeting
Wednesday, June 30, 1999
Warsaw, Poland

Abbreviations:

AD:	Associate Director	ML:	Member List
Brep.	Board of Administration Report	NC:	National Committee
CIECB:	CIE Central Bureau	TC:	Technical Committee
CIEBA:	CIE Board of Administration	TR:	Terms of Reference
CM:	Country Member	ST:	Status
D2:	Division 2 (D1, D4, D8, likewise)	WG:	Working Group

Attendees:

Gorow Baba	(Japan)
Jean Bastie	(France, CIE Vice President)
Lou Bedocs	(UK)
Peter Blaser	(Switzerland)
Anton Bouman	(Netherlands)
Margaret Budzinski	(South Africa)
Joaquin Campos	(Spain)
John Clare	(New Zealand)
Jeanne-Marie Coutin	(France)
Dennis Couzin	(USA)
Jonathan David	(UK)
Edward Early	(USA)
George Eppeldauer	(USA, TC2-48 chair)
Teresa Goodman	(UK, D2 Assoc. Director, TC2-29 chair)
Dider Halkin	(Belgium)

Franz Hengstberger	(South Africa, D2 Director, CIE Vice President Elect)
Christine Hermann	(CIECB General Secretary)
Neil Hodson	(USA, TC2-32 chair)
Jack J. Hsia	(USA, Past CIE President)
Yasuhiro Ikai	(Japan)
Norbert Johnson	(USA, D2 Assoc. Director, TC2-19 Chair)
Carolyn Jones	(USA)
Rainer Köhler	(France, BIPM)
Peter Kohns	(Germany)
Hideki Kondo	(Japan)
Thomas Larason	(USA)
Ian Lewin	(USA)
Hans Allan Lofberg	(Sweden, CIE President)
Janos Makai	(CIECB Technical Manager)
Bruce McArthur	(Canada)
David McDowell	(USA)
John Moore	(UK, D2 Editor, TC2-04 chair, TC2-44 chair)
Osamu Myodo	(Japan)
Yoshi Ohno	(USA, D2 Secretary, TC2-37 chair, TC2-49 chair)
Pasi Orrevetelainen	(Finland)
Allan Ottoson	(Sweden)
Leyla Dokuzer Ozturk	(Turkey)
Jeizy Pietrzykowski	(Poland)
Mark R. Pointer	(UK, D1, D8 Assoc. Director)
M. Luisa Rastello	(Italy, TC2-16 chair)
Reiner Rattunde	(Germany, TC2-40 chair)
J. Rennilson	(USA, TC2-36 chair)
Alan Robertson	(Canada, Past CIE Vice President)
Givseppe Rossi	(Italy)
Georg Sauter	(Germany, TC2-43 chair)
John Scarangello	(USA, TC2-46 chair)
Duco Schreuder	(Netherlands)
Raissa Stolyarevskaya	(Russia)
Guy Vandermeersch	(Belgium, D2 Assoc. Director, TC2-23 chair)
Pierce Webb	(USA)
Gan Xu	(Singapore, TC2-47 chair)
Guanrong Ye	(China)

Total 52 persons from 22 countries, including 16 country representatives attended. Underlines of the countries indicate country representatives. H. Kondo represented Japan for M. Nishi, and A. Robertson represented Canada for J. Zwinkels.

The Division 2 officers mentioned above (and also in the minute below) are still for the 1995 – 1999 term as the new officers had not been appointed at the start of this Division meeting. The CIE Board Officers stated above are for the new term as they had already assumed the positions on June 26, 1999.

Regrets received by Secretary

Gyorgy Czibula (Germany)
Gyula Deszi (Hungary)
Dave Ellis (USA)
Stanko Erste (Slovenia)
Arnold Gaertner (Canada)
Jim Gardner (Australia)
Ganesha (India) TC2-24 chair
Hiroaki Ikeda (Japan), IEC TC100 PT61966
Connie Jonker (South Africa)
Michael Matus (Austria)
Klaus Mielenz (USA), TC2-35 chair
M. Nishi (Japan)
Jim Palmer (USA), TC2-30 chair
Albert Parr (USA), R2-09 reporter
Miklos Racz (Hungary)
John Verrill (UK), TC2-28 chair
Phil Wychorski (USA)
Joanne Zwinkels (Canada), TC2-25 chair

John Verrill sent an apology due to his ill health. He mentioned that would take early retirement from NPL with immediate effect, but he would continue to chair TC 2-28 with a TC secretary appointed and keep his membership in TC 2-25 and 2-39. (See TC2-28 report below for further information.)

Handouts

1) Agenda of the 1999 Division Meeting
2) Quadrennial Report 1995-1999
3) List of TCs, Reporterships, and Liaisons

Call to order

The Division Director, F. Hengstberger, opened the meeting at 8:30, and welcomed all present. The Director introduced Division 2 Officers who were sitting in front: Division Associate Directors, Teresa Goodman (NPL, UK), Guy Vandermeersch (LABORELEC, Belgium), and Norbert Johnson (3M, USA): Division Secretary, Yoshi Ohno (NIST, USA), and Division Editor, John Moore (retired, UK). The Director expressed his special thanks to Yoshi Ohno for his hard work for the last few years to keep Division 2 running actively, and to John Moore for his continuing precise work as the Editor. He also summarized the voting and Board discussions relating to the appointment of a new Division 2 Director for the next quadrennium, as a result of which Teresa Goodman would formally take over as Director at the end of the meeting. The meeting was chaired by the present Director for the agenda items up to 7, at which point the new Director took the chair.

1. Approval of agenda

Agenda of this 1999 Division 2 meeting (Attachment 1) was approved with no changes.

2. Approval of the minutes of the 1998 Division meeting

The minutes of the last Division meeting in Boulder (distributed by e-mail and mail in August 1998) was approved with no corrections.

3. Quadrennial Report

The Director presented the report. The terms of reference were first reviewed. During the last quadrennium, Div. 2 had 9 new TCs commenced and 8 TCs closed. Three TCs had chairmanship changed. Five reporterships were created and four closed. We held annual Division meetings, in 1995 in New Delhi, 1996 in Vienna, and 1997 in Durban where we had a joint meeting with Division 4. We had our last meeting in Boulder, USA in 1998. Division 2 produced four technical reports and one standard. TC2-22 finished their work, and the report is to be published in the next CIE Collection. We maintain a number of liaisons with IEC, ISO, and also with CCPR. We now have 25 active TCs and five reporterships.

Our website has become the center for dissemination of information of the Division. Our website is the model for all other divisions in terms of structure and contents, as recommended by the Secretaries' meeting. The appearance of Divisions' page should have flavor of each division, and should not be standardized. The websites of the divisions are now hosted by various laboratories. Our web server is provided by CSIR, and remotely maintained by our Secretary in the U.S. with no problem. This saves cost for the Central Bureau and the arrangement is to continue in the next quadrennium. We will further develop the contents of our website to further facilitate Division's activities. (The full copy of the Quadrennial Report is in Attachment 6.)

4. Secretary's report (Y. Ohno)

(1) Arrangement for meetings in Warsaw

The Secretary arranged schedules of the TC meetings for Div. 2, trying his best to avoid conflicts with other Division meetings. Some adjustments were made with Divisions 4 and 1, but there still were some overlaps with Division 1 and Division 8, which were unavoidable due to the three-day schedules for all Division meetings. Nevertheless, Div. 2 had 10 TC meetings spread over two days, which was more than any other Division, and enabled much progress to be made this time.

(2) Country members

Div. 2 now has 34 country members, the same as last year. There have been no changes of the country representatives. (After this D2 meeting, the representative of Russia was changed to Raissa Stolyarevskaya.)

(3) The 1998 Activity Report

The 1998 Activity Report, containing the minutes of the 1998 Boulder meeting, was produced and issued in August 1998. This Activity Report, together with the updated D2 Mailing List, was distributed to the mailing list by e-mail, and additionally by mail to all the country members. Before issuing the Report, a draft was posted on a hidden website for comments. This way, the information is made available earlier and also some useful comments can be received. Other than the Activity Report, about ten e-mail circulars were distributed after the Boulder meeting.

(4) Division 2 Mailing List

The D2 mailing list now contains 129 persons (98 last year – 30 % increase), including 34 country members, 25 TC chairpersons, and 70 associates. Associates are those who are not CMs nor TC chairpersons but show interest in D2 activities. Among the 129 entries, 120 have e-mail addresses, which is 93 % of all, a notable progress from last year's 82 %. The rest, 9 persons, are accessed by fax or mail. Email circulars only in text are sent also to fax recipients by using a fax modem without extra effort. Since most circulars are distributed by e-mail now, adding more associates does not increase Secretary's workload. Anybody who would like to be added to the D2 Mailing List is welcome to send a request to the Secretary.

(5) Document format

We started using doc format (MS Word) and PDF format (Adobe Acrobat) as our standard formats last year. CIECB is already using PDF for electronic balloting. As we have not heard of many problems, we will continue using these two formats. While PDF is more reliable in different platforms, the doc format (sometimes liable to problems of version differences) is convenient for sending comments back.

(6) D2 Website

The D2 website has been up and running since 1997. Our server is at CSIR, South Africa., and it has been working very well with no breakdowns. We thank Dr. Hengstberger for his continuing offer to use the CSIR server for CIE D2. The Secretary put much effort to keep the website up-to-date. While maintaining the same structure, much information has been added since last year.

A new use of the website is to use it as a download site. Rather than sending documents as e-mail attachments, the documents are posted on a webpage, and its URL is shown in the email. Attachments often cause problems of taking long connection time for persons traveling or persons using a modem from home. Attachments also sometimes cause receiving troubles. We assume that those who have email access have a website browser also. The Secretary also encourages TC chairpersons to use this method to distribute draft documents. In this case, we can post the document on a hidden URL which is announced only to the TC members, and is accessible only by the TC members (password process is not available at the moment). We tried this for TC2-46 draft, and it worked well. There is a security issue, which we discussed under agenda item 11.

The Secretary also encourages the TC chairpersons to hold virtual meetings on Internet, between physical meetings. If the exchange of information were limited to physical meetings only, the progress would be too slow. A virtual meeting can be announced to TC members by e-mail, with specific agenda, present questions, and try to reach consensus from e-mail responses. To facilitate this, the Secretary will also seek for possibility of setting up e-mail reflectors.

5. Editor's report

(1) CIE S005 to ISO/CIE standard

The document from TC2-33, "CIE Standard Illuminants for Colorimetry", already published as CIE S 005, went through its final stage two months ago, and it has now been published as a joint standard ISO10526/CIE S005. The committee completed the task (The TC was closed in 1998).

(2) TC2-22 Luminous Flux of High-Pressure Sodium Lamps

A short summary of the intercomparison was written by the Editor from material provided by the chairman. The short report will appear in the next edition of CIE Collection. (TC2-22 was closed in 1997).

(3) TC2-35 CIE Standard for V(λ) and V'(λ)

The document "Photometry - The CIE System of Physical Photometry" from the TC has been edited, and is now ready for Division ballot. The reason why it took such a long time was due to some controversial issues raised at final stages, which took a lot of discussions and rewriting, and certainly not due to negligence of the TC chairperson. Agreement is now reached by TC members. Hopefully within the next year, it will be published as a CIE standard, and during the next two years (according to previous example), it is expected to become an ISO/CIE standard. (See 6. TC2-35 on p. 10 for more information.)

(4) TC2-36 Retroreflection: Definition and Measurement (Revision of CIE publication 54)

The document (12^{th} draft) from this TC: "Retroreflection: Definition and Measurement", has been submitted by the chairman, and the Editor has made comments on the draft. The document will shortly go to the Division ballot.

(5) TC2-14 Practical Methods for the Measurement of Reflectance and Transmittance"

This document has been published as CIE 130 (1998) after the Boulder meeting, and the task of the TC is complete.

The Editor raised a concern on the voting procedure for this document. According to the policy of the CIECB and D2, this document was voted with electronic balloting for the first time (for D2). The PDF file was set up at FTP site of CIECB to download the file. The consequence was that there were only 8 votes (8 countries), much less than normally expected. The Editor believes that this poor response of voting was due to electronic balloting. The editor would expect much more responses if the previous procedure (mailing a hardcopy document with a letter) had been taken. He suggests that additional physical mail be sent to confirm receipt of the electronic document and to request voting.

A. Robertson commented that he would more likely to vote with electronic way. N. Johnson commented that the countries interest is at TC level and that comments tend to be made at TC ballot, rather than Division ballot level. F. Hengstberger commented that reminders can be sent by e-mail to get higher response, and also that no response can be considered as affirmative vote.

(6) Div. 2 part of the International Lighting Vocabulary (ILV)

This is also one of the responsibilities of the Editor, but as it is now handled under a TC activity, it will be reported in the section of Reports of TCs.

6. Progress report of Technical Committees

6.1 Technical Committees

Progress reports on the technical committees were given by Associate Directors and Division Director. Associate Director Goodman reported TCs 2-04, 16, 17, 24, 28, 29, 40, 41, 42, 43. AD Johnson reported TCs 2-14, 19, 25, 30, 32, 35, 36, 37, 39, and AD Vandermeersch reported TC2-23 and 2-44. TCs 2-45, 46, 47, 48, 49 were reported by Director Hengstberger as these new TCs had not been assigned to ADs. The reports of all the TCs are shown below in the numerical order of the TCs.

TC2-04 Secondary standard sources
Chair: J. Moore (UK) **AD:** Goodman
ML: Bandyopadhyay (India), Corrons (Spain), Gaertner (Canada), Jiang (China), Low (USA), Metzdorf (Germany), Nishi (Japan), Schanda (Hungary)
TR: Produce a technical report on the selection and operation of stable secondary standard sources.
ST: Report given by the chairperson. The draft has now been done for TC ballot. If there is no objections, it will hopefully go to Division ballot within next few months. The document has a few photographs.

TC2-14 Measurement of Reflectance and Transmittance, Including Turbid Media
Chair: P. Polato (Italy) **AD:** Johnson
ML: Bianchini (Italy), Gundlach (Germany), Hsia (USA), Morren (Belgium), Verrill (UK)
TR: Define the standard geometric conditions for the measurement of transmittance and reflectance.
ST: The document "Practical methods for the measurement of reflectance and transmittance" has been published as CIE 130. The task of this TC has been completed and the TC is closed.

TC2-16 Characterization of the performance of tristimulus colorimeters
Chair: M. L. Rastello (Italy) **AD:** Goodman
ML: Denner (South Africa), Goodman (UK), Hengstberger (South Africa), Moore (UK), Muray (USA), Ohno (USA), Rattunde (Germany), Robertson (Canada), Sauter (Germany), Schanda (Hungary), Steindl (Austria), Terstiege (Germany)
TR: To produce a report recommending methods for assessing the performance of tristimulus colorimeter heads for measuring chromaticity coordinates.
ST: Report given by the chairperson. The TC had several meetings in the past, but not this time because the chairperson preferred to circulate the draft to TC members only at this stage. However, some useful information has been obtained from the conference and meetings of TC2-40 and TC43 (both TC chairs are the members of TC2-16). Their

contribution will be taken into account in the next draft. The chairperson plans to get comments by September, and hopes to have another revision in November, then if members agree, to have TC voting.

TC2-17 Recommendation for integrated irradiance and spectral distribution of simulated solar radiation

Chair: D. Kockott (Germany) **AD:** Goodman

ML: Aydinli (Germany), Goodman (UK), Ignatiev (Russia), Justus (USA), Kaase (Germany), Kasten (Germany), Kok (South Africa), Wilkenson (Australia), Zerlaut (USA)

TR: Revise and update CIE Publication No.20 (1972)

ST: Report given by the AD. 18 months or so ago, the chairman sent out the draft document (on solar simulators for testing purposes) to the whole Division. He got some responses but not very much. The chairman would still like to have more input from TC members or from those with an interest in this subject. AD Goodman requested that anybody who has comments on or interest in the document should contact the chairman by e-mail. Goodman will also contact the chairman to ask him to send his draft to the Secretary so that the document can be posted at a hidden webpage for wider distribution.

TC2-19 Measurement of the Spectral Coefficient of Retroreflection

Chair: N. Johnson (USA) **AD:** Johnson

ML: Arens (USA), Brekke (Norway), Fisher (USA), Hsia (USA), Hubert (France), Kurioka (Japan), Price (UK), Rendu (France), Rennilson (USA), Richey (Germany), Schreiber (Germany), Sugiyama (Japan), Terstiege (Germany), Vandermeersch (Belgium)

TR: Identify the critical measurement parameters, tolerances, and requirements for, and conduct an international intercomparison of, the spectral coefficient of retroreflection.

ST: Report given by the chairperson. The completion of the TC document is delayed due to a strong request for one more set of data to be included. The chairman expects to obtain the data shortly and finalize the analysis to prepare the final draft for TC voting this year.

TC2-23 Photometry of Street-Lighting Luminaires.

Chair: G. Vandermeersch (Belgium) **AD:** Vandermeersch

ML: Arens (US), Blaser (Switzerland), Blochouse (Belgium), Claassens (NL), Corrons (Spain), Price (UK), Rattunde (Germany), Rossi (Italy), Simons (UK), Sorensen (Denmark)

TR: Prepare a technical report on the photometry of street lighting luminaires.

ST: Report given by the chairman. This TC has not started its work yet because, the TC waited for the results of the intercomparison within Europe, which started in 1996 and finished just at the end of last year.

Soardo (Italy), the Pilot laboratory of the comparison, was requested to give a brief report on the status of the intercomparison. The project for intercomparison of luminaires started three years ago with the support of the European Commission. Two types of luminaires were used, one with 260 W HPS and another with fluorescent tubes. The intercomparison measurements have finished. Provisional results are available. There are no problems in measurement compatibility. There are problems in measurement of street lighting luminaries, due to aiming difficulties. There are large differences in luminous intensity distribution. A meeting was held with the 12 participants. The draft paper is to be

distributed by end of the year and then the paper is to be published.

Vandermeersch added that the participants of this intercomparison to be the initial TC members, but it was planed to try to attract members from countries other than Europe as well. Anybody interested in this TC should contact the chairman.

TC2-24 Users guide for the selection of illuminance and luminance meters

Chair: K. Ganesha (India) **AD:** Goodman

ML: Andor (Hungary), Arens (USA), Austin (USA), Bastie (France), Chang (Taiwan), Dibbern (Germany), Eppeldauer (USA), Gardner (Australia), Goodman (UK), Hengstberger (S. Africa), Moore (UK), Muray (USA), Ohno (USA), Rennilson (USA), Ritzol (USA), Sauter (Germany), Sojourner (USA)

TR: Prepare a user's guide for the selection and use of illuminance and luminance meters.

ST: Report given by the AD. The chairman had some trouble with communication in the past, but he has now obtained his own e-mail address and hopes to be able to communicate better. He is awaiting responses to his letter of June 1998 sent to TC members. Response so far has been disappointing. AD Goodman encourages the attendees and TC members to contact the TC chairman to provide him with more input, in order to get the committee work in progress and to produce this important document. Contact by email will be the most rapid way forward. The chairman's new mail: research74@mantraonline.com

< Secretary note>

The chairman sent out another letter with proposed table of contents and a questionnaire form at the beginning of June 1999.

TC2-25 Calibration Methods and Photoluminescent Standard for Total Radiance Factor Measurement

Chair: J. Zwinkels (Canada) **AD:** Johnson

ML: Bristow (Sweden), Erb (Germany), Leland (USA), McCamy (USA), Nayatani (Japan), Puebla (Germany), Racz (Hungary), Simon (USA), Witt (Germany), Verrill (UK)

TR: Prepare a CIE report on methods for measurement of total radiance factors of photoluminescent materials. Recommendations for realizing and calibrating photoluminescent standards by the one and two-monochromator method will be included.

ST: Written report submitted. The TC met May 6, 1999 in Vancouver, B.C. in conjunction with the Inter-Society Color Council meeting. Five TC members and 2 observers were in attendance. The eighth draft of the TC report was distributed and discussed. Figures have been added and equation, table and figure numbering have been edited to conform with CIE guidelines. Remaining action items are some minor revisions to the text and to re-group the references at the end of the document. The revised document (ninth draft) will be circulated for TC ballot.

TC2-28 Methods of characterizing spectrophotometers

Chair: J. Verrill (UK) **AD:** Goodman

ML: Andor (Hungary), Bastie (France), Berns (USA), Distl (Germany), Eckerle (USA), Konstantinova (Bulgaria), McCamy (USA), Robertson (Canada), Sugiyama (Japan), Ulyanov (Russia), Zwinkels (Canada)

TR: Write a CIE report on the characterization of spectrophotometers by means of reference

materials and other methods, with particular reference to linearity, wavelength error, stray light, and integrating sphere errors.

ST: Report given by AD. The progress has been delayed slightly due to poor health of the chairman. The 4th draft is nearing completion and will be circulated within the next few months. If there are no major changes, the 5th draft will be circulated for TC ballot in the autumn this year. The chairman is retiring from NPL in June 1999, and has appointed a TC Secretary, Peter Clarke (NPL, UK) to assist him in incorporating comments from the last draft, and all the figures and references have now been added. Contact to the TC chairman can be made via TC secretary: Dr. Peter Clarke, NPL, UK (email: peter.clarke@npl.co.uk).

<Secretary note>

The chairman, Mr. John Verrill, passed away on June 29th, a day before this Division meeting, as informed several days after the D2 meeting. P. Clarke is expected to take over this committee.

TC2-29 Measurement of detector linearity

Chair: T. Goodman (UK) **AD:** Goodman

ML: Andor (Hungary), Bastie (France), Bittar (New Zealand), Budde (Canada), Distl (Germany), Dezsi (Hungary), Mihailov (Russia), Mostl (Germany), Ohno, Parr (USA)

TR: Prepare a CIE guide on methods for the characterization of the linearity of detectors of optical radiation, including different principles by which the linearity of detectors can be determined and causes of non-linear behavior, to aid users of optical radiation detectors in the selection and use suitable devices for specific applications.

ST: Report given by the chairperson. Progress has been slow during the past year, due to a reorganization of the chairman's responsibilities. However, this is now resolved and work on the third draft is now well underway. The third draft should be sent to TC members within the next few months.

TC2-30 Array Radiometry

Chair: Jim Palmer (USA) **AD:** Johnson

ML: Abasari (Hungary), Andoh (Japan), Goodman (UK), Jones (USA), Mihailov (Russia), Pfleger (Austria), Sauter (Germany)

TR: Prepare an annotated bibliography for the CIE journal on diode array radiometry. Make appropriate recommendations for future work in diode array radiometry.

ST: Report given by the AD. The chairmanship has changed to Jim Palmer (Univ. Arizona, USA) after the Boulder meeting. The previous chairman, P. Wychorski, sent the TC documents and materials to the new chairman just recently. The new chairman is to start the work to finish the document and publish it in a CIE Collection.

TC2-32 Measuring Retroreflectance of Wet Horizontal Road Markings

Chair: N. Hodson (USA) **AD:** Johnson

ML: Austin (USA), Davies (USA), Dibbern (Germany), Hubert (France), Johnson (USA), Lundkvistl (Sweden), Meydan (Australia), Meseberg (Germany), Rennilson (USA),

Schmidt-Clausen (Germany), Schnell (USA), Schreuder (Netherlands), Soardo (Italy), Sorenson (Denmark) – revised August, 1999

TR: To prepare a guide for the methods of measuring coefficient of retroreflected luminance (specific luminance) of horizontal road markings under wet weather conditions.

ST: Report given by the chairman. This TC was re-started a year ago in Boulder with the new chairman. The TC had the second meeting on Monday 28th June in Warsaw. The TC agreed on a rough draft with outlines of chapters and sections. There were active discussions on a lot of issues, which have become a good input for the next draft. The TC plans to do annual testing, later this year or spring next year, to do actual measurements on wet pavement markings. Some TC members volunteered to update several sections of draft.

TC2-35 CIE Standard for V(λ) and V'(λ)

Chair: K. Mielenz (USA) **AD:** Johnson

ML: Bastie (France), Gardner (Australia), Hengstberger (South Africa), Moore (UK), Ohno (USA), Parr (USA), Robertson (Canada), Sauter (Germany), Schanda (Hungary)

TR: To prepare a new CIE Standard on the present V(λ) and V'(λ) functions.

ST: As covered in the Editor's report, the TC document "Photometry - The CIE System of Physical Photometry" has been edited by the Editor, and is now ready for Division ballot. (See 5. Editor's report above.)

<Discussion>

Sauter, one of the active members of the TC, was requested to give additional information. Comments were made on the document a few years ago regarding the relationship between CIE and CIPM. The problem is now solved with the revised document, and he believes the document is now ready for publication. Ohno mentioned that there have been a few revisions of the document by the chairman and by the Editor, and now it is complete and ready for Division ballot. Division Editor commented that he discussed with the chairman about the need for another TC ballot and they felt that, as a number of people already commented and much time spent on revising the draft, there would be no need for another ballot. The Editor Moore agrees the chairman's proposal to go now directly to Division ballot. Robertson suggested that, since the document went through many changes between a few persons, the document should be sent to TC members for information before ballot. Moore will relay this opinion to the chairman. Hengstberger asked about the change of the title of the document. Moore answered that the title of document does not have to be the same as the title of the TC; it has been decided by the TC to have this title rather than that of the TC; the title is extremely important for standards because a summary (normally comes in three languages for technical reports) does not accompany standards.

TC2-36 Retroreflection: Definition and Measurement (Revision of CIE Publication 54, Liaison with CEN/226) **AD:** Johnson

Chair: J. Rennilson (USA)

ML: Arens (USA), Couzin (USA), Dibbern (Germany), Heenan (USA), Hubert (France), Johnson (USA), Kramp (Germany), Nanjo (Japan), Price (UK), Schmidt-Clausen (Germany), Sorensen (Denmark), Terstiege (Germany), Werner (Sweden) – revised, August 1999.

TR: To revise and update publication 54. To standardize test methods and measurement geometry for measuring the photometric and colorimetric properties of all types of retroreflectors under both day and nighttime conditions. To prepare this CIE document in ISO format to be issued as a joint CIE/ISO standard.

ST: Report given by the chairman. The TC has made much progress and is nearing completion. The TC just sent out the 12th draft for TC ballot. Two ballots were received back with comments and one negative vote. The TC met again this time in Warsaw and resolve these comments. New wording is to be added in the draft. The draft has also been edited by the Editor with many comments. A bibliography will be worked on and completed within one month. Next draft to be sent for Division ballot around August. The TC has agreed in the committee level that this committee is not to produce ISO/CIE standard. It is probable that a new committee will be proposed to produce standards based on this document.

Hengstberger added that this TC is listed on the website as one of the TCs producing CIE standards. This is now not the case, so the website will need to be corrected.

(Communication from the chairman, Aug. 26, 1999: 14th draft has been completed and approved by the TC. The TC Activity report has been submitted to the Secretary as attached to this document – Attachment 5.)

TC2-37 Photometry Using Detectors as Transfer Standards

Chair: Y. Ohno (USA) **AD:** Johnson

ML: Andor (Hungary), Austin (USA), Bastie (France), Bittar (New Zealand), Czibula (Germany), Corrons (Spain), Dezsi (Hungary), Eppeldauer (USA), Gardner (Australia), Goodman (U.K.), Köhler (BIPM), Muray (USA), Pietrzykowski (Poland), Rattunde (Germany), Rastello (Italy), Sauter (Germany), Schanda (Hungary), Sojourner (USA), Wychorski (USA)

TR: To prepare a report on the properties of $V(\lambda)$-corrected detectors that are suitable for disseminating and maintaining photometric units. This report will include methods for the use of these detectors.

ST: Report given by the chairman. The last meeting was in Boulder, and now the draft is close to completion. Apology was expressed for the little progress on this TC this time, due to the chairman giving priority to the work of his other committee (TC2-49). The draft will only need changes of wording of several terms to give clearer definitions. This will be done in the next few months and the next draft is expected to be circulated for a TC ballot.

Director Hengstberger mentioned the chairman's heavy workload as the Secretary of the Division, chair of two TCs, and also organizer of the workshop on Photometry of Flashing Lights this time.

TC2-39 Geometric Tolerances for Colorimetry

Chair: D. Rich (USA) **AD:** Johnson

ML: Baba (Japan), Bittar (New Zealand), Decarreau (France), Fisch (USA), Hanssen (USA), Jordan (Canada), Johnson (USA), Kravetz (USA), Ladson (USA), Terstiege (Germany), Pietrzykowski (Poland), Verrill (UK), Zwinkels (Canada). Consulting member: Erb (Germany). – revised June 1999.

TR: Compile a technical report and recommendations specifying the geometric tolerances for the various geometries in colorimetry, including 0/45, 0/d and others. Parts of this technical report may be suitable for inclusion in a CIE standard specifying several geometric tolerance levels.

Working Program:

Utilize ISO 5/1 and ASTM E 1767 to develop a system of specifications for the geometry of color measurements. Define the specifications in the following order: Reflectance factor (t/8, d/8, d/0), radiance factor (45/0) and transmittance geometries (0/0, d/0). Specifications will be developed via computer simulation & verified experimentally.

ST: Written report submitted. The Committee met for the fifth time just prior to the CIE Division 2 meeting in Warsaw. Five committee members and six guests were present. In reviewing the terminology, it was agreed that the final report would have a separate section on terminology. The action items shown in the 1998 Activity Report had not been fulfilled due to the change of the chairman's affiliations and also to no actions by other members. After discussion on the current draft, the TC agreed on changes on five points. During the next few months, the chairman will prepare a second draft of the final report and distribute the draft to committee members for comment. The next draft will be written and distributed by 15 December 1999. The committee desires to hold the next meeting in conjunction with the ASTM B-12 Color and Appearance meeting, to be held in Toronto, Canada in June of 2000. The TC will not be meeting during the Division meetings at NPL in April 2000. For further details, see Attachment 2 (TC2-39 Activity Report, 29 June, 1999).

TC2-40 Characterizing the Performance of Illuminance and Luminance Meters

Chair: R. Rattunde (Germany) **AD:** Goodman

ML: Austin (USA), Bastie (France), Czibula (Germany), Dezsi (Hungary), Goodman (UK), Khandelwal (India), Khanh (Germany), Mahidharia (India), Moore (UK), Ohno (USA), Pietrzykowski (Poland), Saito (Japan), Sauter (Germany), Stolyarevskaya (Russia), Xu (Singapore), Ye (China) – revised July 1999

TR: Convert the present CIE Technical Report No. 69 into an ISO/IEC standard. Prepare a combined CIE/ISO standard describing the definitions of quantities influencing the performance of illuminance and luminance meters, as well as defining measurement procedures for the individual error quantities.

ST: Report given by the chairman. The TC had its 4th meeting on June 28th in Warsaw with 26 attendants. 9 of the 16 members had been present. The chairman presented the 3rd draft of the document which included some of the comments of the last meeting in Boulder 1998. No further written comments had been received by the chairman from the members since then. The TC discussed the general contents of the document and finally made a decision on the further treatment of the document. According to this, the chairman will submit a ballot per e-mail to the members and ask for opinions whether to modify the title, introduction chapter, or scope of the document together with text proposals within the next 2 months. (The draft will be posted at a hidden website by the Secretary.) The chairman will add the modifications according to the majority opinions into the draft and submit it to the Associate Director for further processing by the CIE. Next meeting will be held in conjunction with CIE D2 in spring 2000, at NPL, London, UK if necessary. (The minutes of the TC meeting were later distributed as in Attachment 3.)

<Discussion>

Moore as an Editor asked when the document would be ready for submission to the editor. The chairman plans to produce the next version in three months, which may be ready for TC voting if there are no major problems. Goodman commented that any issues on the guidance as to how to select and use illuminance/luminance meters should be dealt within TC2-24, and requested the attendees to provide such input to Ganesha.

<Secretary note>

CEN standards are being developed on the same subject and are nearing completion. The current TC draft seeks to harmonize with this CEN document. The chairman will keep TC members posted on the status of the CEN activity and is willing to send a copy of the document if requested.

TC2-41 Industrial Photometry in Developing Countries

Chair: B. Bhattacharya (India) **AD:** Goodman

ML: Chanchanchop (Thailand), Goodman (UK), Moscati (Brazil), Ohno (USA), Sastri (India), Sauter (Germany), Ye (China)

TR: To prepare a Technical Report giving guidance on recommended practices for photometric measurement (including sphere photometry and goniophotometry), taking account of the special requirements of industrial laboratories in developing countries.

ST: Report given by the AD. There has been no substantial activity since the establishment of the TC in 1995, and we have no contact from the chairman for the last two years regarding the work of this TC. Thus it is suggested that this TC be resolved unless we have other proposals for solution. Later at the meeting, the Division agreed to close this TC.

TC2-42 Colorimetry of Visual Displays

Chair: A. Hanson (UK) **AD:** Goodman

ML: Andor (Hungary), Berns (USA), Dalton (UK), Fairchild (USA), Ikeda (Japan), Hardis (USA), Leone (USA), Luo (UK), Maelfeyt (Belgium), MacDonald (UK), McFadden (Canada), Munger (Canada), Reid (UK), Schanda (Austria), Stokes (USA), Sakata (Japan), Stienstra (Netherlands), Ohno (USA), Vienot (France)

TR: To produce a Technical Report summarizing recommended practice for the measurement of the colorimetric and spectroradiometric properties of visual displays.

ST: Report given by the AD. Progress has been slow during the past few years, due to changes in the chairman's responsibilities. However, important liaisons with other groups including IEC are being maintained and it is anticipated that a draft document should be available for TC comment shortly.

<Discussion>

Moore asked how this TC relates to the work of Division 8. Director Hengstberger commented that, following discussions with D8 Director, it had been agreed that such matters as published in the earlier document (CIE 122), for example, should go to Division 8, but this TC should stay in Division 2. Ohno commented that he was at the last D8 meeting in Baltimore, and talked about this TC, and that there was good communication with D8. Rennilson suggested that the title of the TC be changed to make clear to the people of D8 that this TC is dealing with measurements. D2 agreed to add the word "measurement" in the title.

TC2-43 Determination of measurement uncertainties in photometry.

Chair: G. Sauter (Germany) **AD:** Goodman

ML: Bastie (France), Corrons (Spain), Goodman (UK), Köhler (BIPM), Moore (UK), Ohno (USA)

TR: To prepare a CIE recommendation as basis for the determination of measurement uncertainties valid for selected quantities used in photometry.

ST: Report given by the chairman. The TC had its second meeting this time in Warsaw with 23 attendees. There was much discussion on the structure. The document now consists of two major parts: the first part is the summary of all the equations used for determination of uncertainties, the second part consists of several examples, from simple ones to difficult ones. The second part should give more explanation to assist technicians as well as scientists to understand calculation and definitions of the uncertainties. Further written comments are requested in the next two months, and a next version is to be prepared for discussion at the next meeting in UK.

TC2-44 Vocabulary Matters

Chair: J. Moore (UK) **AD:** Vandermeersch

ML: Billmeyer (USA), Burghout (Netherlands), Ionescu (Romania), Johnson (USA), Köhler (BIPM), Morren (Belgium), Nishi (Japan), Ohno (USA), Poppe (Hungary), Sauter (Germany), Schanda (Hungary), Woo (Canada)

TR: To provide liaison between Div.2 and TC 7-06 "Lighting Terminology" and support the preparation of the new edition of the Lighting Vocabulary in the field of light and colour measurements.

ST: Report given by the chairman. ILV (International Lighting Vocabulary) is being revised and this TC is responsible for D2 terms. The chairman circulated possible new terms (about 300) to members. Comments have been collected and compiled for revision, and the second mailing is being prepared. Different opinions should reach consensus in the second mailing. As a guiding principle to assess the suitability of terms, the view taken within the TC that ILV is not a scientific dictionary, nor text book. Thus it has been agreed to eliminate technical principles and figures (which should be in technical reports) and decided that ILV should stick to strictly definitions. If other Divisions have different opinions, the policy must be harmonized.

<Discussion>

Hermann (CIECB) commented that D1 has almost finished their final version of their terms. As soon as it is finalized, she will send a copy to Moore for D2 to review. D2 is one of the last ones. Director Hengstberger mentioned that the vocabulary committee would not wait for receiving all the Divisions before submitting to IEC. Submission of the terms, Division by Division, will avoid delaying the whole process. The Director proposes that D2 should have detailed discussions on the way we do this in future, at regular meetings of the Publication Board. Director Hengstberger is now the Vice President for Publications, and intends to form a Publication Board consisting of Division Editors, CIECB, and possibly some other members. The Board will have the first meeting in Budapest, just before the CIE Symposium at the end of September 1999. The vocabulary issue will be one of the issues for discussion there. Vocabulary is a living thing and should be updated much faster than in the past. Editor Moore added a point that doing this Division by Division presents a

problem that there are many measurement terms used in other Divisions (particularly D1, D4, D8), and we do not always agree: we may need some new approaches.

The following TCs (2-45 through 2-49) were established last year after the Boulder meeting. Reports were given by Director Hengstberger and the TC chairpersons. The ADs of these TCs have not been assigned at the time of this meeting.

TC2-45 Measurement of LEDs - Revision of CIE 127

Chair: Kathleen Muray (USA) **AD:**

ML: Austin (USA), Bando (Japan), Balta (USA), Berkhout (USA), Bouman (Netherlands), Budzinski (South Africa), Bym (USA), Carr (USA), Distl (Germany), Ellis (USA), Fleischer (USA), Gan (Singapore), Guenther (Germany), Halkin (Belgium), Heidel (Germany), Jones (USA), Kohmoto (Japan), Larsen (Denmark), Marchl (Germany), Moore (UK), Myers (USA), Ohno (USA), Rastello (Italy), Sauter (Germany), Scarangello (USA), Schanda (Hungary), Solomon (Taiwan), Stolyarevskaya (Russia), Webb (USA), Young (USA) – revised Aug. 99.

TR: Revise CIE Pub. 127 to include improved definitions of quantities and methods of measurement for total flux and partial flux of LEDs and to reevaluate other parts including spectral and color measurements of LEDs.

ST: Report given by C. Jones (USA) on behalf of the chairman. This is a continuation of TC2-34 and deals with additional issues to be resolved. The TC was established last year in Boulder. Two TC meetings have been held, in Gaithersburg at CORM'99 in May, and in Warsaw this time, both chaired by the chairperson K. Murray. The meeting in Warsaw focused on defining the measurement quantities for partial flux, and the TC came to an agreement on this. Next draft will be circulated within next few months for further comments. There are issues still to be addressed, including assessment of $V(\lambda)$ match and spectral measurements of LEDs. Next meeting is planned for April 2000 in UK.

TC2-46 CIE/ISO standards on LED intensity measurements

Chair: John Scarangello (USA) **AD:**

ML: Angerstein (Germany), Bando (Japan), Bouman (Netherlands), Bym (USA), Carr (USA), Distl (Germany), Ellis (USA), Goodman (UK), Heidel (Germany), Hwang (Taiwan), Jones (USA), Lester (USA), Moore (UK), Ohno (USA), Rastello (Italy), Sauter (Germany), Scarangello (USA), Schanda (Austria), Schumacher (Germany), Sojourner (USA).

TR: To prepare a CIE/ISO standard on the measurement of LED intensity measurements based on the CIE Pub. 127.

ST: Report given by the chairman. The TC started with the original members from TC2-34. The TC first met in Gaithersburg on May 3, 1999 with the first draft discussed and some new members added. The TC met again this time in Warsaw with the second draft reviewed, and had good discussions and inputs on several key questions. The scope of the document is clarified, and the TC agreed to use other CIE publications as much as possible on detector issues and to include more information on uncertainty calculations. The TC also reached general consensus that f1' is not good for LEDs, but this issue should be addressed outside this committee, perhaps at some other TC, as it is expected that it will

take substantial new work and time. The chairman will prepare the next draft before the next D2 meeting. The first draft was put on the hidden website as a trial, which worked well. Further versions will follow the same way.

<Discussion>

Director Hengstberger commented that this subject of LEDs is important for D2 in the sense that we are making contributions in the area of optoelectronics, which is new for the CIE, i.e. in some ways we are in a similar position as that of D8 in the imaging technology field. D2 published CIE127, which was very timely, and it is good to have two new TCs on LEDs immediately after publication of CIE127. This is a sensible approach i.e. not to wait for ultimate completeness of the document, but to issue what is needed at the right time. Other TCs should consider this approach.

TC2-47 Characterization and Calibration Methods of UV Radiometers

Chair: Gan Xu (Singapore) **AD:**

ML: Hengstberger (South Africa), Wilkinson (Australia), Lambe (UK), Rattunde (Germany), Saunders (USA), Pietrzykowski (Poland), Corrons (Spain), Larason (USA), Thompson (USA), Kohmoto (Japan), McArthur (Canada), Kravetz (USA)

TR: Prepare a CIE recommendation on methods of characterization and calibration of broad-band UV radiometers in the spectral ranges of UVA and UVB for industrial applications.

ST: Report given by the chairman. The TC started last year with the formal invitation sent out to members in November. The TC had 12 members before Warsaw conference. A target of completing the document in 2002 was set. The chairman circulated a draft table of contents in January 1999. The TC met for the first time in Warsaw with 30 attendees, discussed the revised version of the table of contents, and had active feedback from members and guests. More members are expected to join after Warsaw. The TC made decisions on some key issues. The UVNET (a three-year project under EUROMET and the EU) is developing standard documents in the same area, including one on characterization of UV radiometers (first draft produced by WG1 in October 98). The document copy was circulated among TC members with the permission of the UVNET WG1 chairman. The document has taken the identical terminology and technical approach to CIE Pub. 69. There was an initial concern on overlap and duplication of work. The TC invited two representatives from UVNET WG1 to attend the TC meeting in Warsaw, and also had a representative from the World Meteorological Organization (WMO), which also has a WG on UV radiometry for solar UV measurements. The TC has established contacts with these groups and is having friendly discussions. UVNET expressed their wish to collaborate with CIE. Thus, keeping close contact with them, the TC will continue on to develop the technical report. The chairman is still not sure if the liaison with UVNET should be kept in TC level or Division level and requested advice.

<Discussion>

Director Hengstberger reminded attendees that this TC is resumption of the work by J. Krochmann and later by Poppe, which was closed for a while because no chairperson could be found. Hengstberger asked if the UVNET is producing CEN standards. Chairman answered that the final objective of this UVNET is not clear; information varies depending on sources, and this needs to be clarified. Hengstberger commented that this document from UVNET has taken probably 90 % of the content from CIE 69, and there is obviously an issue of copyright. We need to find a policy of CIE how to handle such situations, as this

may happen more. This issue should be discussed at Publication Board meeting in Budapest. Goodman noted that she had discussion with the representative from UVNET and had provisionally agreed that their document would not be published as a CEN standard but as a CIE standard. We need to formalize this arrangement and avoid any conflict or duplication of effort.

TC2-48 Spectral responsivity measurement of detectors, radiometers, and photometers
Chair: G. Eppeldauer (USA) **AD:**
ML: Austin (USA), Boivin (Canada), Bouman (USA), Corrons (Spain), Coutin (France), Dezsi (Hungary), Gardner (Australia), Goodman (UK), Köhler (BIPM), Larason (USA), Larsen (Denmark), McArthur (Canada), Ohkubo (Japan), Palmer (USA), Pietrzykowski (Poland), Rattunde (Germany), Sauter (Germany), Webb (USA), Xu (Singapore),– revised Aug. 99.
TR: To rewrite the technical report CIE 64 (1984) "Determination of the spectral responsivity of optical radiation detectors" to update device and measurement technology, and include the spectral irradiance responsivity measurement for radiometers and photometers from UV to near IR.
ST: Report given by Chairman. After the Boulder meeting, the chairman wrote an outline of the document, mailed to 16 members of the TC, and had first meeting here in Warsaw with about 25 attendees. The scope of the paper was discussed, and it was agreed to include radiance responsivity, in addition to radiant power responsivity and irradiance responsivity that were originally proposed. The TC agreed on the table of contents and the modified structure of the report. The TC plan to meet for the second time in London. The chairman plans to finish the report in 3 to 4 years.

TC2-49 Photometry of Flashing Light
Chair: Y. Ohno (USA) **AD:**
ML: Arens (USA), Austin (USA), Berkhout (USA), Couzin (USA), Ellis (USA), Eppeldauer (USA), Goodman (UK), Hengstberger (South Africa), Köhler (BIPM), Kondo (Japan), Rattunde (Germany), Schmidt-Clausen (Germany), Sauter (Germany), Webb (USA) –revised July 1999.
TR: Produce a technical report for photometric measurements of flashing light, including derivation of the photometric quantities applied to flashing light, measurement of light sources, and calibration of photometers for flashing light.
ST: Report given by the chairman. The TC had its first meeting in Warsaw with about 25 attendees, including 8 initial members. As discussed at the Workshop in the previous week, various new issues have been recently raised in the measurement of flashing lights, especially for signaling applications in roadway, sea, and air traffic. The TC will produce the first CIE document on photometry of flashing lights, but addressing only the physical measurement aspects. The issues on human vision aspects will not be covered in this TC, but should be produced in a document from Division 1. The chairman prepared the scope and the table of contents of the document, which were discussed at the meeting. After active discussions, with several points clarified and some new suggestions made, the TC agreed on the scope and basic structure of the document. The TC added 3 new members after the meeting. The TC came to a consensus that a new document from Division 1 is urgently needed, and requests Division 1 consider this. The chairman plans to develop the first draft by next physical meeting in London, and hopes to finish the document in 3 years.

Hengstberger added that it would be ideal if our document could refer to a D1 publication dealing with vision aspects of flashing lights, but it is clear from discussion at Workshop and TC meeting that it would delay D2 document if we wait for D1 document. It was decided that D2 would prepare this report using what is available in references, since manufacturers and users are already using such instruments. CIE must put something in place to give guidance and to ensure that flashing lights are dealt with in a uniform way with available present knowledge.

Additional Discussions

1) How the Division 2 meeting should be structured

After report by AD Goodman, Director Hengstberger made a comment that the discussion we have today in the Division meeting is limited to overviews and brief summaries of the state of the TCs, and is not for technical discussions. If anybody wants to make any technical inputs, all the TC chairpersons are always willing to receive them. But, if the TC is nearing completion of the document, care should also be taken not to obstruct the efficiency of the committee.

Editor Moore commented that, in Division 1, they have many discussions on technical issues in their Division meetings. There is an advantage in having discussions on controversial issues with a large audience. D2 should consider having more technical discussions, perhaps with an extended schedule. Pointer (Div.1 AD) commented that D1 have more controversial issues than D2 does, and he enjoys this meeting and feels D2 is doing fine. AD Johnson mentioned that the scheduling of the TC meetings was available in advance this time, which was extremely valuable. This has given some additional opportunities for people to attend these TC meetings and discuss technical contents. Hengstberger added that, before this D2 meeting, we had two days of TC meetings, which were attended by many guests making the room always full. However, he appreciated Edtor's comment, and requested more inputs from the audience by e-mail to find the best way. AD Goodman (as the new Director) also requested comments from the attendees by email regarding whether changes should be made to the format of D2 meetings.

2) Collaboration with Division 4 in the area of luminaire measurement

After the report by AD Vandermeersch, he reported that, in accordance with the suggestion of the Division, he has been trying to liaise better with D4 by attending D4 meetings himself, and now added two TC members from D4 in his group.

6.2. Reporterships

R2-05 Visual Gloss (J. Taylor, UK) **AD:** Goodman

ST: AD Goodman reported. Little change from the previous year. There is work going on in several countries around the world on the measurements of appearance. At the moment, because things are still developing, it is not yet time to set up a TC, but the reporter will keep monitoring to see if there is any change in the situation.

R2-06 Standardization of Measuring Geometry for the Colorimetry of Metallic Coatings (C. McCamy, USA) **AD:** Johnson

ST: A written report was submitted from the reporter. About a year ago, as chairman of the ASTM subcommittee on geometry, McCamy met with the chairman of the ASTM subcommittee on metallic and pearlescent colors. It was agreed that the geometry subcommittee would prepare a standard method of describing the geometry of multi-angle spectrophotometers, to provide a basis for a specific standard method of measuring metallic and pearlescent colors. The third draft of the geometry standard is in preparation and will be sent to subcommittee ballot in about one month. It will provide the formal basis for describing uniplanar, annular, and circumferential configurations and a configuration in which the specimen is illuminated diffusely and reflected light is measured at a number of elevation angles. This last method is used with interference pigments. The subcommittee on metallic and pearlescent colors is maintaining close liaison with my committee and has begun writing a standard. (See Attachment 4 for the full report from McCamy.)

<Discussion>

Moore asked about the relationship between ASTM, e.g., and CIE, because in many highly specialized areas such as metallic coatings, we do not have sufficient expertise among members of CIE. Expertise is found in small groups of commercially interested companies, and ASTM has more contact with them than CIE does. Moore questions whether CIE committees could do something in such specialized areas.

Director Hengstberger commented that there is already close cooperation between ASTM and DIN on this subject and what they come up with will be close to international consensus. It will still require international standardization body like CIE and that might be the time we should come in. We have an effective mechanism – reportership - to keep our membership informed on what is going on in the area to find such needs and we have full cooperation with ASTM and other bodies.

R2-09 Absolute Cryogenic Radiometers (A. Parr, USA) **AD:** Johnson

ST: Report given Ohno. At the time of last Boulder meeting, the reporter was still ambitious to see applications of cryogenic radiometers at the industry level, and has been paying attention in this respect. While many cryogenic radiometers have already been installed around the world (nearly 30), all of them are at national or government-related laboratories and not at industry level, and at present observation, they are not likely to spread in industry. Thus, while we still keep watching this area, he proposes to close this reportership for now. If the situation changes, this reportership should be reactivated. D2 agreed.

R2-17 Aviation Photometry (Y. Ohno, USA) **AD:** Goodman

ML: Bhagat (USA), Hengstberger (South Africa), Verdier (France)

ST: Ohno reported. TC2-49 was proposed from this reportership and established in Boulder. This reportership was kept open to see if there was any need for collaboration with ICAO (International Civil Aviation Organization). However, despite an attempt to contact them, the chairman did not receive active response from them, and thus, it was proposed to close this reportership. D2 agreed.

R2-18 OIML Matters (G. Sauter, Germany) **AD:** Hengstberger

ST: Sauter reported. There are no new issues this time. Hold this reportership open for the future.

R2-21 Use of detectors as absolute transfer standards for spectroradiometry (N. Fox, UK) **AD:** Goodman

ST: Goodman reported. Much work is going on in this area at several national laboratories, but is not yet well-enough developed to establish a TC. The situation will continue to be monitored.

R2-22 Implementation of Photometric Units (R. Köhler, BIPM) **AD:** Vandermeersch

ST: Köhler reported. He has obtained no new inputs since last year. The reportership is kept open to get some inputs from the CIE Symposium in Budapest (75 Years of CIE Photometry).

<Discussions>

Moore commented. When the proposal was made two years ago, his intention was to indicate how the measurements might be best made, whatever the mesopic model may be, and have joint discussion and report with D1 and D2 to investigate possible means of measurement. Another point was the need to associate the measurement of quantities for mesopic photometry with the SI unit. DE discussed his ideas with a few people, who expressed the general opinion that it is not yet the time because D1 is not proposing a mesopic model yet. Even when we have a mesopic model, substantial measurement problems will still exist because the mesopic observer is not a single function. Moore's paper in Budapest will suggest one method for making measurement and to set standards in mesopic region. There is the possibility that some work may be funded by the EU in this area.

Vandermeersch mentioned a paper by Ian Lewin on problems with street lighting suggesting that high-pressure sodium lamps and low-pressure sodium lamps are not as efficient as photometric measurements suggest by factor of 4 and 20, respectively; and it is urgent that CIE gives advice on such issues. Ian Lewin commented that TC1-37 is considering alternate methods of photometry in the mesopic region, and it is essential that this committee feeds to D2. The TC is basically addressing the subject from the standpoint of brightness matching functions. However, there is completely separate set of researches based on visual performance functions, coming up with different mesopic functions, which must be investigated by the TC.

Director Hengstberger requested Köhler to prepare summary of inputs from the Symposium in Budapest and from the CCPR on how the photometric quantities in mesopic region can be associated with the SI.

6.3. Liaison report

CCPR (Köhler)

Köhler reported. CIPM is preparing MRA (mutual recognition agreement) to be signed by national laboratories in October based on the outcome of Key comparisons. CCPR

quadrennial meeting took place in March this year. The work done at national laboratories over the last four years was reviewed. Six intercomparisons have been established as Key Comparisons.

(1) Spectral irradiance (led by NPL) to be finished by 2000.
(2) Spectral responsivity, divided into three parts: IR (led by NIST) now in progress, visible (300 – 1000 nm) led by BIPM will start next year, and UV (led by PTB) to be done by 2001.
(3) Luminous responsivity, led by BIPM: Draft B agreed by CCPR, and final report being prepared.
(4) Luminous intensity / luminous flux, run by PTB: Draft B agreed by CCPR, and final report being prepared. Much discussion on determination of reference value.
(5) Spectral diffuse reflectance (led by NIST) planned to start next year.
(6) Transmittance (led by BNM/INM)

CCPR also have supplemental comparisons – cryogenic radiometers (led by BIPM, the results now being accepted by CCPR), aperture area (led by NIST, to be started shortly), and spectral radiance of lamps (led by VNIIOFI also planned). All the results of CCPR intercomparisons will be posted at the BIPM website. Interactive database will be up in November. WG on Key comparisons will meet at next NEWRAD meeting.

IEC TC34A on Lamps, TC34D on Luminaires (Vandermeersch)

Vandermeersch reported. In TC34 A (standardization on electric, mechanical, and photometric characteristics), IEC fully refers to CIE for photometric characteristics, and there was no specific needs for liaison during the last year. In CENELEC, some photometric methods are included in the specification of mandated labeling of lamps and ballasts related to flux and power consumption. This needs attention by D2. Last year, TC34D (luminaires) produced a new edition of publication IEC 598 2-22 Emergency luminaires. Light distribution and luminous output of emergency luminaires are clearly defined in the specification as safety requirements. This standard is also taken over by CENELEC 34Z. This IEC standard 34D refers to CIE for measurement methods. There are no clear procedures on measurement of light output and maintenance values of luminous flux of emergency luminaires including aging and batteries. Thus Vandermeersch proposes a new reportership (reactivation of R2-19), with help of Lou Bedocs, to prepare for a TC on photometry of emergency luminaires. Lou Bedocs (UK) accepted to undertake this reportership.

IEC TC100/PT61966 -Colour Measurement and Management in Multimedia System (Y. Ohno)

Ohno reported. This committee is very active. Ohno is an official liaison member from CIE D2. The chairman, H. Ikeda, is also on our D2 mailing list, and we are in good communication. They are now developing about ten standard documents. Many of the documents specify the characterization methods and measurement procedures for each type of display – CRT, LCD, plasma, etc. Ohno, Schanda, and Hanson, from CIE, contributed comments to Part 2 (standard RGB), Part 3 (CRT), Part 4 (LCD), and Part 9 (digital cameras) for the past year. These documents are close to being published. Part 7 (color printers) and Part 8 (scanners) follows. Part.5 (plasma display) and Part 6 (projection displays) are at early stages. CIECB

also receives these documents for comments and voting. These documents include specifications of color measuring instruments and procedures of measurement of color and other optical properties of displays. As they have few metrology experts, it is important that CIE assists this committee. The documents are being developed at a fast pace, and it is difficult to cover all of these. Anybody in Div.2 active in this area is requested to join Ohno to review the committee documents. All the draft documents and meeting reports of this committee are open to the public and available at their website: http://www.map.chiba-u.ac.jp

JTAG2 – ISO/IEC Joint Technical Advisory Group 2 (A. Robertson)

The Secretary reported. Alan Robertson resigned as the CIE representative to JTAG2 due to his increased workload. Dave McDowell (USA), who is the chair of JTAG2, tentatively serves as the CIE representative himself, but he is looking for a person who can serve as an official liaison representative from CIE. One of the recent issues at JTAG2 was the overlap of the digital camera document between ISO TC42 (Photography) and IEC TC100. In reply to the question from H. Kondo, Ohno answered that ISO TC42 made a decision not to overlap the scope of the TC42 document with IEC TC100 61966. This liaison is covered tentatively by the Secretary.

From this point to the end, the meeting was chaired by the new Director Teresa Goodman.

ISO TC6/WG3 (J. Zwinkels)

Report received from Zwinkels and read by AD Johnson. The most recent meeting of TC6/WG3 was held on May 31, 1999 in Helsinki, Finland. The main issues discussed were: the ISO/TC 6 calibration system, the results of a recent round-robin comparison of the ISO authorized laboratories, the procedure of adjusting fluorescent reference standard data for 45/0 geometry to conform with ISO 2469 (d/0) measurement conditions, and the DIN proposal for a 45° gloss measurement standard. The following ISO draft standards were reviewed and comments given to CIE CB and/or to Chair of ISO/TC6 WG3:

1) ISO/DIS 5631 "Paper, board and pulps – Determination of colour – (C/2°) Diffuse Reflectance Method"
2) ISO/DIS 11476 "Papers and boards – Determination of CIE whiteness, C/2° (indoor illumination conditions)"
3) ISO/FDIS 8254-1 "Paper and board - Measurement of specular gloss Part 1: 75 degree gloss with a converging beam, TAPPI method"
4) ISO/FDIS 2470 "Paper and board – Measurement of diffuse blue reflectance factor (ISO brightness)" (revision)

<Discussions>

Hengstberger reported that CIE have received an open invitation from ISO TC6 to participate in their revision of ISO standard 4094 Paper Board and Pulps, and asked for opinions on this. In this committee, the issues of calibration of testing apparatus, nomination and acceptance of standardizing and authorized laboratories are addressed.

Robertson added that the committee seems to be concerned that standard laboratories are not continually doing absolute measurements to maintain their reflectance scales. NRC is doing it on regular basis, and PTB and NIST on less regular basis. NPL are in the process of establishing a new, independent, scale. CCPR is organizing an intercomparison, piloted by NIST, which should provide data for the committee.

Hengstberger suggested that these three laboratories should participate in the work of ISO TC6. Hsia suggested that VNIIOFI also should, and Stolyarevskaya agreed to take the message back. The ways and forms of this collaboration will be discussed later. Hengstberger will also contact Zwinkels who is on this committee.

ISO TC160 SC2 WG2 Glass in buildings, Light & energy transfer (J. Hsia)

Hsia (past CIE President) reported. This liaison was set up in early days to provide a contact person when they have technical questions. For several years, no inquiries or technical assistance have been requested, and Hsia suggested this liaison be closed; any issues on this subject can be brought to the ISO/CIE liaison meeting now held once a year. Lofberg (the new CIE President), who is the liaison officer from D3, has the same experience and seconded the proposal. D2 agreed to close this liaison.

ISO TC 180/SC 1: Solar energy/Climate - Measurement and data (Dieter Kockott)

No information received from Kockott. Hengstberger commented that the purpose of this liaison was to make sure that TC2-17 document on the solar simulator is harmonized with this committee. Once the document is published, this liaison can be left to CIECB.

7. Dissolution of TCs and other functions

TC2-14 Measurement of Reflectance and Transmittance, Including Turbid Media

The document has been published as CIE 130 (1998), and the task of the TC is complete. The TC is closed.

TC2-41 Industrial photometry.

There has been no progress for the past 4 years. No new chairpersons nor any other solutions were suggested, and D2 agreed to close this TC.

R2-09 Cryogenic radiometer.

Following the proposal by the reporter, D2 agreed to close this reportership.

R2-17 Aviation Photometry

Following the proposal by the reporter, D2 agreed to close this reportership.

Liaison: ISO TC160 SC2 WG2 Glass in buildings, Light & energy transfer

This liaison is closed per proposal by the liaison officer.

8. Proposal for NEW TCs and Reporterships

New TCs

(1) Measurement of the optical properties of LED clusters and arrays

TR: To produce a technical report for the measurement of optical properties of visible LED arrays and clusters, to derive optical quantities for large LED arrays and recommendations for measurement methods and conditions.
Chairman: Georg Sauter (Germany)

Sauter made this proposal by stating that we now have document on measurement of single LEDs (CIE 127) and two new committees working on measurement of LEDs but still dealing with single LEDs. The same configuration or quantities cannot be used for clusters and arrays of LEDs. The application of LED arrays and clusters is expanding and there now needs to be recommendations on measurements for such groups of LEDs.

Ohno commented that similar issue (measurement of LED traffic signs) has been raised by J. Arens, who is active in D4 and D2, in some other meetings in the past, and suggested that the chairperson contact him. Goodman seconded Sauter's proposal. Answering questions, Sauter added that the spectral range covered in this committee will be the visible, and primarily photometry and colorimetry will be addressed. The proposal was approved with no objections. Sauter called for new members.

(2) Calibration of diode-array spectrometers

TR: To produce a technical report which sets out guidelines for the recommended procedures, methods and transfer standards for the calibration of diode array spectrometers.
Chairman: Richard Austin (USA)

Goodman made the proposal. There is gradual shift from fixed scanning systems to array systems, and there are a number of problems in the calibration of such systems which are unique and due to the fact that these types of spectrometers use detector arrays. Thus a recommendation in this subject is in demand. The proposal was approved with no objections.

New Reporterships

(1) Emergency Lighting Luminaires - Reporter: Lou Bedocs (UK)

As reported under the liaisons, Vandermeersch proposed this reportership, and Lou Bedocs accepted to be the reporter. D2 agreed.

(2) ISO/CIE Standards for the measurement of reflectance and transmittance - Reporter: Danny Rich (USA)

Hengstberger pointed out that the original intention of TC2-14 was to establish standards, which was amended to a technical report. He asked if we should set up a new TC to turn the document (CIE130) into CIE standards. Moore commented as Editor that this document is

extremely complicated and is covering a complete range of possible geometries and he therefore expects great difficulties in converting it to a standard. The proposal in D1 also dramatically changes some of the definitions, which makes it more difficult. D2 voted to establish a reportership this time rather than a new TC. Rich is suggested for the reporter.

(3) Classification of color measuring instruments - Reporter: Yoshi Ohno (USA)

Proposed by Ohno. At the first D8 meeting in Baltimore in Oct. 98, a reportership on grading color measuring instruments was established, with Ohno assigned as the reporter. D8 would like to have a guide on selection of color measuring instruments (including colorimeters and spectroradiometers) according to the various applications and uncertainties required. Commercial color measuring instruments do not give clear and consistent specifications. We have classification of illuminance/luminance meters in the TC2-40 draft document. Similar guidelines are needed for color measuring instruments. Ohno thinks the work must be done by D2, but does not have clear view yet of the scope of the guide and of the chairperson. The relationship with TC2-16 and the new TC on diode array spectrometers (R. Austin) should also be investigated. D2 agreed to establish a reportership on this subject. Sauter commented that the specification must be on characteristics, not on the uncertainty of instruments because uncertainty can only be stated with measurement conditions.

(4) Liaison with IALA (International Association of Lighthouse Authorities) - Reporter: Ian Tutt (UK)

Proposed by Ohno. IALA wishes to publish an international standard based on their previous document "Recommendations on the Determination of the Luminous Intensity of a Marine Aid-to-Navigation lights (1977)", and is requesting assistance from D2. There is another standardization effort in Europe by AIDO (Industrial Association of Optics) and this conflict or overlap should also be resolved. (A paper representing AIDO was given by Passi Orreveteläinen in this Warsaw Session.) IALA has just established a WG to write a standard on this subject, which, they hope, is to be published as a CIE/ISO standard. We need to clarify the situation and plan for a possible new TC. Hengstberger supported it and commented that D4 encourages CIE involvement in more forms of transportation, and this area (sea navigation) applies to another form of transportation. D2 agreed to establish this reportership. Ian Tutt, a member of IALA, was recommended for the reporter.

New Liaisons – Division 8: Y. Ohno (USA)

Proposed by Ohno who has become the liaison person in D8 for D2. D2 agreed to establish this new liaison as an official channel between the two Divisions.

Other discussions – New form of CIE publications

Director Hengstberger announced a plan by the CIE Board to publish a new type of CIE publication - handbooks or encyclopedia on the subject matter of the Division or a subcategory of the Division – e.g., a handbook of colorimetry from D1. Key features of this publication are that it will contain all the relevant CIE publications that deal with that subject, it will be published by a commercial publisher, not by the CIE, and it will be updated at every quadrennium. If we are to produce such types of publication, the Divisions must have a plan for how to compile the first version and then to continuously update it at every

quadrennium. It was felt that such a publication would attract a much greater number of readers than the way CIE publications are sold now. Hengstberger suggested a TC should be formed to investigate the necessary work for this plan.

There were several questions and answers for clarification of the plan. Hengstberger added that this publication is not restricted to each Division. Colorimetry, e.g., can be compiled by D1 and D2. Moore commented that the sales of CIE publications and availability in libraries e.g., are now very limited, and strongly supports this idea of such a new publication, and expects enormous expansion of the field of readers as well as income.

However, D2 did not reach a consensus for the exact form of this new work. Goodman suggested that the management team would consider this and come back with a proposal. At the same time, opinions and suggestions from all D2 members and associates are requested. Emails are welcome at the Division Director or Secretary.

9. New Division Officers for the 1999 - 2003 term

The new Director was elected by the CIE Board during the Board Meeting in Warsaw, taking into consideration the balance of countries and other factors, in addition to the voting result from the Division. Other officers were appointed by the new Director as below and she expressed her gratitude to the existing officers, that they had all agreed to continue in their previous roles. She also, on behalf of the Division, thanked the outgoing Director for his hard work during the past 2 quadrennia.

Director:	Teresa Goodman (UK)	
Associate Directors:		
	Norbert Johnson (USA)	…. For optical properties of materials
	Guy Vandermeersch (Belgium)	…. For luminaires
	Georg Sauter (Germany)	…. For sources and detectors
Editor:	John Moore (UK)	
Secretary:	Yoshi Ohno (USA)	

10. Future meetings

2000: 6-8 April at NPL, UK, in conjunction with NPL Colour and Visual Scales 2000 and NPL centennial celebrations, 3-5 April, at NPL. D1 also meets on the same dates. D8 will meet on 10th and after 13th of April in Derby in conjunction with Colour Image Science Conference, 10-12 April, at Univ. Derby.

2001: 17-18 May at NIST, USA, in conjunction with CORM2001 and NIST centennial celebrations. There will be CIE Midterm Session in Turkey in September, but D2 will not meet in Turkey. NEWRAD2001 will be in late October at NIST, Gaithersburg, USA.

2002: Open (any suggestions are welcome.)

2003: San Diego has been elected for the 25th Session of CIE. The Session is planned for early July. D2 will meet in San Diego.

11. General

(1) Handling of TC documents on the website

Hengstberger and the Secretary raised an issue of handling TC documents on the website. The secretary started posting TC draft documents on a hidden page of the D2 website, when requested by the TC chair, as a means to distribute the documents to the TC members. Since the hidden page is not perfectly secure, a password access will be introduced when a setting is made in the CSIR server. In this case, we have two options: 1) all the TC documents are accessed by one password, allowing any TC members to access other TC documents as well, 2) documents of each TC are accessed by a different password, allowing the TC members to access their own TC documents only. We have to consider between convenience and the level of security. Discussions as below followed.

Lofberg stressed the importance of the security because final draft would be taken by many people instead of buying the documents. Goodman supported the second option because it gives more control over the distribution of TC documents, ensuring, for example, that only those with a good knowledge of the TC subject are able to see early drafts. Moore favored individual password for each TC because of the risk of hurting publication sales. Sauter raised a possibility of charging for accessing CIE documents (publications) on the website. Hengstberger commented that, as Vice President of Publication, we are considering moving into electronic commerce. IEC already sells their publications that way. Drafts are a different story. Sauter mentioned that, for drafts, it should be made accessible by TC members and non-members also, but with frequent change of password. Köhler pointed out that the documents are distributed freely anyway to anybody sitting at the TC meetings. Makai mentioned that it would be difficult to inform the change of password to all the TC members if one password is used for all the TCs. Vandermeersch suggested to look at how IEC does and said that CIE should form a general policy. Ohno commented that IEC TC100 posts all their draft documents on their website with no password requirement. (Passwords are required on official IEC website.) Larason mentioned that, if a person is on several committees, it would be hard to keep up with changes of many passwords if they are separate for different TCs. Hengstberger suggested that we should go step by step as technology develops, starting with a simpler way. Goodman took informal votes from all attendees on the preference on one password for all TCs or each password for each TC. The results were half by half. Hengstberger concluded that he would put this in the agenda of the publication board, and try to get input from them also. We will come back to this issue at next meeting, and any further comments are welcome by email to the Secretary

(2) TC3-22 Museum lighting

Jonathan David (representing CIBSE, and a member of TC3-22) raised this issue. TC3-22 Museum Lighting is discussing the need for testing UV-cut films at regular intervals, and they need advice from D2 on the measurement of the films. Moore, who is also a member of the committee, commented that he believes it is not appropriate, and he will discuss this with Kit Cuttle (who is the member of the committee suggesting this testing).

(3) John Verrill

Goodman informed the Division that John Verrill was seriously ill and would take early retirement from NPL with immediate effect. An album with messages and signatures of CIE people was being prepared for him. Attendees were requested to sign in the album. (See also the section of TC2-28 in the Report of TCs.)

(4) CIE in the year 2000

Goodman reported that there were a lot of discussions in the Board over recent years how to take CIE into year 2000. It has been suggested that each Division should have brainstorming sessions to trying to generate some ideas about what CIE should do. We will put this in the agenda for the next division meeting, and encourage all to think about it. Contact Goodman by email or bring your ideas at the next meeting. We will have a brainstorming session next time.

12. Adjournment

The Division 2 meeting was adjourned at 3:30 pm.

Attachments

(1) Agenda of the 1999 Division 2 Meeting
(2) TC2-39 Activity Report (June 29, 1999)
(3) TC2-40 Minutes of the TC meeting (June 30, 1999)
(4) R2-06 Status Report (June 10, 1999)
(5) TC2-36 Activity Report (August 27, 1999)
(6) 1995-1999 Division 2 Quadrennial Report (June 1999)

Attachment 1

COMMISSION INTERNATIONALE DE L'ÉCLAIRAGE
INTERNATIONAL COMMISSION ON ILLUMINATION
INTERNATIONALE BELEUCHTUNGSKOMMISSION

DIVISION 2 : PHYSICAL MEASUREMENT OF LIGHT AND RADIATION

1999 DIVISION 2 MEETING

Warsaw, Poland
08:30 - 17:00
Wednesday, 30 June, 1999

Agenda

1. Approval of agenda
2. Approval of the minutes of the 1998 Division meeting
3. Quadrennial Report
4. Secretary's report
5. Editor's report
6. Progress reports from Technical Committees, reporters and liaison persons
    - 6.1 Associate Director Goodman and TC chairpersons
    - 6.2 Associate Director Johnson and TC chairpersons
    - 6.3 Associate Director Vandermeersch and TC chairpersons
    - 6.4 Other TCs
    - 6.5 Reporters
    - 6.6 Liaisons with other organisations
7. Proposals for dissolution of TCs and reporterships
8. Proposals for new TCs and reporterships
9. New Division Officers for 1999-2003
10. Future meetings
11. General

Attachment 2

TC2-39 Committee Activity Report
Geometric Tolerances for Color Measurement
29 June, 1999

Terms of Reference

Compile a technical report and recommendations specifying the geometric tolerances for the various geometries in colorimetry, including 0/45, 0/d and others. Parts of this technical report may be suitable for inclusion in a CIE standard specifying several geometric tolerance levels.

Working Program

Utilize ISO 5/1 and ASTM E 1767 to develop a system of specifications for the geometry of color measurements. Define the specifications in the following order: Reflectance factor (t/8, d/8, d/0), radiance factor (45/0) and transmittance geometries (0/0, d/0). Specifications will be developed via computer simulation & verified experimentally.

Current Committee Membership:
A Bittar (New Zealand), J. Verrill (United Kingdom), L. Hanssen (USA), G. Baba (Japan), B. Jordon (Canada), J. Zwinkels (Canada), H. Terstiege (Germany), N. Johnson (USA), D. Rich (USA), Chairman, R. Fisch (USA), J. Pietrzykowski (Poland), A. Kravetz (USA), J. Ladson (USA), J. Decarreau (France)
Consulting Member: W. Erb (Germany)

Status

The Committee met for the fifth time just prior to the CIE Division 2 meeting in Warsaw, Poland at the Technical University of Warsaw. Five committee members and six guests were present. An agenda was handed out and approved. The minutes and activity report from 1998 were reviewed and approved. There were some questions about the terminology issues that were decided at the last meeting. In reviewing the terminology it was suggested by committee members that the final report have a separate section on terminology, even though this is not standard in a CIE report. The TCC agreed to draft such a section. It was reported that none of the action items shown in the 1998 Activity Report had been fulfilled. The TCC took partial responsibility for this as he had changed affiliations and had not been able to retrieve his CIE committee documents until just recently. The members from NIST and 3M have also forgotten about their action items and the TCC was unable to find the documents to remind them. This next year will be better.

A first draft of the final report was distributed for discussion. Discussions during the meeting resulted in the following actions:

1. There was a general agreement on the reference specifications for the three geometries described in the draft.
2. General comments included a) the report needs more figures. N. Johnson agreed to send drawings and/or PowerPoint files to include in the document; b) the scope needs to be rewritten so as to more clearly identify that the three levels of tolerances do not represent

"good, bad, worse" but rather ranges of geometries suitable to various types of materials, surface effects and applications. More Lambertian materials may be successfully characterized on any of the geometries but difficult to measure specimens or material standards may require one geometry rather than another.

3. It was suggested that one needs to know how the cone angles are distributed across the sample port. To do this, there should be some specification and tolerances on the size of the specimen port for any set of influx and efflux angles. One way to do this would be to analyze the geometric design of an instrument, ray by ray. The TCC feels this would be too restrictive on the color community. It was then suggested that the report change from a two parameter (influx : efflux) angle based specification to a three parameter (influx aperture, efflux aperture, specimen aperture).
4. One committee member suggested that the report include two different specific examples of a design of each reference geometry to illustrate the use of the methods described in the final report.
5. There was a lot of discussion about how to handle reference specification for difficult to measure specimens, such as metallic flake paints or retroreflective sheeting. The TCC will review this issue and draft a position to be included in the scope of the next draft.

Action Items:

1. During the next few months, the chairman will prepare a second draft of the final report and distribute the draft to committee members for comment.
2. NIST, Murakami and 3M have volunteered to supply some measurement data on standard and practical materials (matte, semi-gloss, glossy paint, ceramic tiles, plastics) to verify the reference geometry and the effect of the tolerances.
3. D. Couzin will talk to C. McCamy about how to transform the ISO 5 geometry system into a three parameter system and draft a defining paragraph to be added to the final report.
4. Ted Early and Maria Nadal at NIST will take the place of Leonard Hansen from NIST on the committee.
5. The TCC will contact Greg McGee of Labsphere about materials on specifying and verifying the design of integrating spheres.
6. The next draft will be written and distributed by 15 December, 1999.

The committee desires to hold the next meeting in conjunction with the ASTM E-12 Color and Appearance meeting, to be held in Toronto, Canada in June of 2000. The TC will not be meeting during the Division meetings at NPL in April 2000.

Respectfully submitted,

Danny Rich, TCC

Attachment 3

CIE Division 2 TC 2-40
Characterizing the Performance of Illuminance Meters and Luminance Meters

Minutes of 4th Meeting in Warsaw, June 28th,1999

Opening, Presence and Membership

The meeting toke place at Polytech Warsaw, Room 149A, Monday, June 28th, 1999 with the attendance of 26 people, where 9 of the 16 members were present. The attendance list is attached.

Approval of Agenda

The agenda was distributed by the chairman and approved.

Approval of minutes from the 3rd meeting in Boulder (presented in CIE Div. 2 Activity Report August 98)

The minutes as printed in the CIE Div.2 Activity Report August 1998 have been approved.

Discussion of third draft of CIE/ISO Standard "Characterizing the Performance of Illuminance Meters and Luminance Meters", June 99

The chairman presented the 3rd draft of the document which included some of the comments of the last meeting in Boulder 1998. No further written comments had been received by the chairman from the members since then.
The chairman pointed out the importance of this document for the use in the industry, especially as similar work is going on in other organizations, such as European Standardization CEN. The chairman will make available the latest draft of the CEN –Standard to the members in electronic format by use of the Divisions web site.
The TC discussed the general content of the CIE/ISO Standard draft and finally made a decision on the further treatment of the document after intensive discussions about technical details, especially the characteristic of the $V(\lambda)$ match f_1'.
According to this the chairman will submit a ballot per e-mail to the members and ask for opinions whether to modify the title, introduction chapter, or scope of the document together with text proposals within the next 2 months. The chairman will add the modifications according to the majority opinions into the draft and submit it to the Associate Director for further processing through the CIE.

The chairman will submit a file copy of the document to CIE to be posted on the web, so that members can easily download the document for their own use.

Any other business

None.

Dates and location of next meeting

If necessary, the next meeting will take place during the next Div. 2 meeting at NPL, London, UK, in spring 2000. In this case it will be announced in the CIE Div. 2 report or on the Div.2 web site.

Dr.-Ing. Reiner Rattunde, Chairman
Berlin, June 30th, 1999

Attachment 4

Report to CIE Division 2
from
Reporter R2-06 Standardization of Measuring Geometry
for the
Colorimetry of Metallic Paints

C. S. McCamy, Reporter
June 10, 1999

For about six years, committees of the American Society for Testing and Materials (ASTM) and the German standards organization (DIN) have been attempting to standardized measuring geometry for measuring metallic materials. Almost all of the work has been done with the assumption that the specimen would be illuminated directionally at 45° to the specimen normal. In that case, the incident beam and the normal to the specimen define a plane of incidence and the reflected light is measured in that plane, at several angles relative to the specular direction. Such a configuration is called "uniplanar." Another somewhat different configuration has come into commercial use. The receiver is located on the specimen normal and the specimen is illuminated by a number of small illuminators arrayed in circles. For each selected angle of incidence, the illuminators are all at the same elevation angle, but at many azimuthal angles. In the terminology of the ASTM, this is called "circumferential" illumination. About a year ago, as chairman of the ASTM subcommittee on geometry, I met with the chairman of the ASTM subcommittee on metallic and pearlescent colors. We agreed that the geometry subcommittee would prepare a standard method of describing the geometry of multi-angle spectrophotometers, to provide a basis for a specific standard method of measuring metallic and pearlescent colors. The third draft of the geometry standard is in preparation and will be sent to subcommittee ballot in about a month. It will provide the formal basis for describing uniplanar, annular, and circumferential configurations and a configuration in which the specimen is illuminated diffusely and reflected light is measured at a number of elevation angles. This last method is used with interference pigments. The subcommittee on metallic and pearlescent colors is maintaining close liaison with my committee and has begun writing a standard.

Two of my recent papers introduced a number of new concepts and associated terminology for the description of metallic materials:

Observation and measurement of the appearance of metallic materials. Part I. Macro Appearance, *Color Res. Appl.*, 21, 292-304 (1996).

Observation and measurement of the appearance of metallic materials. Part II. Micro Appearance, *Color Res. Appl.*, 23, 362-373 (1998).

Attachment 5

TC 2-36 Committee Activity Report
Retroreflection: Definition and Measurement
Revision of CIE Publication 54

August 27, 1999

Terms of Reference:

To revise and expand CIE Publication #54 on Retroreflection. To standardized test methods and measurement geometry for measuring the photometric and colorimetric properties of all types of retroreflectors under both day and nighttime conditions. (Revised term of reference as per Warsaw meeting).

History:

A reportership was established in 1991 in Melbourne to look into revising CIE Publication 54 on Retroreflection. My report indicated that many new materials had been developed since 1982 and a revision was highly desirable. In June 1992 the Board of Administration concurred and Technical Committee 2-36 was formed with the above terms of reference.

Membership:

The present members of the committee are:

J. Arens (USA), D. Couzin (USA), P. Dibbern (Germany), R. Hubert (France), N. Johnson (USA), W. Kramp (Germany), M. Nanjo (Japan), D. Price (Great Britian), J. Rennilson (USA, Chairman), H. Schmidt-Clausen (Germany), K. Sorensen (Denmark), H. Terstiege (Germany), G. Werner (Sweden)

Consultants: T. Early (USA), C.C. Miller (USA)

Status:

This committee has meet many times in seven different countries and completed fourteen drafts of a technical report. The last meeting was held during the CIE Session in Warsaw, Poland. Six members of the thirteen members and one consultant were present at the meeting. A vote on the 12th draft was distributed before the meeting and two ballots were returned with one comment and two negatives. After a worthwhile discussion some of the comments were included and the negatives considered persuasive and resolved by additional changes and wording. Comments were also received from the editor and accepted. A new summary will be written. A bibliography will be included as soon as possible but should not hold up the Division balloting. One additional draft was written and comments received from several members and upon many e-mail correspondence, a 14th draft was prepared. This draft approved by the members was sent to the Division Director, Editor and Central Bureau for voting. The terms of reference were modified by dropping the requirement for a CIE/ISO standard as the committee decided this was best to be left to a new Technical Committee to extract the information from this report appropriate for standards use.

Dependent on the results of the ballot the comments or negatives will be resolved without holding another meeting before the Division 2 meets again. Formal approval would then await the next Division 2 meeting.

Respectfully submitted,

Justin Rennilson, TCC

Attachment 6

COMMISSION INTERNATIONALE DE L'ECLAIRAGE
INTERNATIONAL COMMISSION ON ILLUMINATION
INTERNATIONALE BELEUCHTUNGSKOMMISSION

DIVISION 2: PHYSICAL MEASUREMENT OF LIGHT AND RADIATION

QUADRENNIAL REPORT 1995-1999

1. TERMS OF REFERENCE

To study standard procedures for the evaluation of UV, visible and IR radiation, global radiation and optical properties of materials and luminaires. To study optical properties and performance of physical detectors and other devices required for this evaluation.

2. ADMINISTRATIVE MATTERS

F Hengstberger (South Africa) was appointed for a second term as **Division Director** by the CIE Board at the 1995 CIE Session in New Delhi. He in turn re-appointed the three previous **Associate Directors**, namely T Goodman (UK) and G Vandermeersch (Belgium) and N Johnson (USA). Although not followed rigidly (with geographic location sometimes overriding the rule), the Associate Directors' responsibilities were divided into Technical Committees dealing with sources and detectors (Goodman), materials (Johnson) and luminaires (Vandermeersch).

Y Ohno (USA) was appointed **Division Secretary** and J Moore (UK) as **Division Editor**.

The following **new Technical Committees** commenced work during the quadrennium:

TC2-41 "Industrial photometry in developing countries", chairperson: B Bhattacharya (India),

TC2-42 "The colorimetrry of visual displays ", chairperson: A R. Hanson (UK),

TC2-43 "Determination of measurement uncertainties in photometry", chairperson: G Sauter (Germany)

TC2-44 "Vocabulary Matters", chairperson: J R Moore (UK)

TC2-45 "Measurement of LEDs - Revision of CIE 127", chairperson: K Muray (USA)

TC2-46 "CIE/ISO standard on LED intensity measurements", chairperson: J Scarangello (USA),

TC2-47 “Characterization and Calibration Methods of UV Radiometers”, chairperson: Gan Xu (Singapore)

TC2-48 “Spectral responsivity measurement of detectors, radiometers, and photometers”, G Eppeldauer (USA)

TC2-49 “Photometry of Flashing Lights”, Y Ohno (USA)

Dissolved Technical Committees:

TC2-10: "Photometry and Goniophotometry of Luminaires", chairperson: G. Vandermeersch (Belgium),

TC2-11: "Gonioreflectometry of Standard Materials", chairperson: J Hsia (USA),

TC2-22: "Luminous Flux of High-Pressure Sodium Lamps", chairperson: B Garzo (Hungary),

TC2-26: "The Relationship between Digital and Colorimetric Data for Computer-Controlled Color CRT Displays", chairperson: R. Berns (USA),

TC2-31: “Methods of characterizing actinic radiometers”, chairperson: Poppe (Hungary),

TC2-33 “Reformulation of CIE Standard Illuminants A and D65 (revision of CIE/ISO 10526)”, chairperson: K D Mielenz (USA)

TC2-34 “LED measurements”, chairperson: K Muray (USA)

TC2-38: "Flare Photometry", chairperson: F. Denner (South Africa),

There were **changes in TC chairpersons** in the following Technical Committees:

TC2-24: "Users guide for the selection of illuminance and luminance meters", previous chairperson: J Moore (UK), new chairperson: K. Ganesha (India),

TC2-30: “Diode-array radiometry”, previous chairperson: P Wychorski (USA), new chairperson: J Palmer (USA),

TC2-32 “Measuring retroreflectance of wet horizontal road markings”, previous chairperson: T Bradshaw (USA), new chairperson: Hodson (USA).

New reporterships were established in the following areas:

R2-17: “Aviation photometry”, reporter: Y Ohno (USA)

R2-18: “OIML matters”, reporter: G Sauter (Germany)

R2-19: “Emergency lighting luminaires”, reporter: L Bedocs (UK)

R2-20: “Vocabulary matters”, reporter: J Moore (UK)

R2-21: "Use of detectors as absolute transfer standards for spectroradiometry”, reporter: N Fox (UK),

Dissolved reporterships:

R2-15: "Colorimetry of lustre pigments", reporter: Größwang (Austria),

R2-16: “Optical multimeters”, reporter: R Distl (Germany),

R2-19: “Emergency lighting luminaires”, reporter: L Bedocs (UK),

R2-20: “Vocabulary matters”, reporter: J Moore (UK)

Most reporterships were dissolved after producing a report on their subject matter , a few others due to inactivity. The produced reports were either published in the CIE collections or led to the formation of Technical committees.

Changed reporterships:

None.

3. MEETINGS

In order to make the attendance of Division meetings more worthwhile for Division members and consultants, these meetings were scheduled to precede or follow other major conferences and symposia in optical radiometry. A further benefit of such an arrangement is the opportunity to attract new contributors to the Divisional working programme from attendants of the associated event. The following **Division meetings** were held:

6 November 1995, New Delhi (India)	-	during the 23rd CIE quadrennial session,
31 August 1996, Vienna (Austria)	-	in conjunction with the Division 6 meeting,
4 September 1997, Durban (South Africa)	-	in conjunction with an International Conference on Lighting in Developing Countries and meetings of Divisions 3, 4, 6 and 7. A joint meeting with Division 4 was held to discuss matters of common concern,
19 May 1998, Boulder (USA)	-	in conjunction with CORM98.

4. TECHNICAL REPORTS AND PUBLICATIONS

The following **CIE Technical Reports** were published:

Publication CIE 121-1996, "The Photometry and Goniophotometry of Luminaires",
Publication CIE 122-1996, "The Relationship Between Digital and Colorimetric Data for Computer - Controlled CRT Displays",
Publication CIE 127-1997, "Measurement of LEDs",
Publication CIE 130-1998, "Practical Methods for the Measurement of Reflectance and Transmittance".

The following **CIE Standards** were published:

CIE Standard S005/E-1998, "CIE Standard Illuminants for Colorimetry".

The report of TC2-22 "Luminous Flux of High-Pressure Sodium Lamps" has been completed in 1997 and will be published in one of the next CIE Collections.

5. INTERNATIONAL LIAISONS

Liaisons were maintained with the following international organizations:

Comite Consultativ de Photometrie et Radiometrie (CCPR)	- R Köhler (BIPM),
IEC TC34A on lamps	- G Vandermeersch (Belgium),
IEC TC 34D on luminaires	- G Vandermeersch (Belgium),
IEC TC100 on Audio, Video and Multimedia Systems and Equipment	- Y Ohno (USA),

IEC/ISO JTAG2: Joint Technical Advisory Group 2 - A Robertson (Canada),

ISO TC6 SC2 on optical properties of paper and pulp - J Zwinkels (Canada),

ISO TC160 SC2 WG 2 on glass in buildings, light & energy transfer - J Hsia (USA),

ISO TC180 SC1 on solar energy/climate measurement and data - D Kockot (Germany),

6. TECHNICAL COMMITTEE WORK IN PROGRESS

NAME	STATUS
2-04 Secondary standard sources (J Moore, UK)	The greater part of the report has been completed for some time. Objections were made in Durban relating to planned photographs and illustrations, which might be able to be identified. Increasing the number of different types of lamps illustrated may solve this. Chairman planned to circulate for TC ballot at the end of June 1998. No further progress report since
2-16 Characterization of the performance of tristimulous colorimeters (M Rastello, Italy)	Report given by P. Soardo at a TC meeting for Rastello on May 18th 1998 in Boulder with about 30 participants. The fourth draft (changes marked on the third draft) was distributed and discussed. Suggested changes were to be compiled by the chairperson for a fifth draft, which was tol be distributed before the Warsaw Session when the next TC meeting is planned.
2-17 Recommendation for integrated irradiance and spectral distribution of simulated solar radiation (D Kockot, Germany)	The draft document 'Solar simulators for testing purposes' was circulated to all D2 members for comments following the Durban meeting, to ensure a wide range of applications was considered. This has generated some response and the chairman was to prepare a revised draft.
2-19 Measurement of the spectral coefficient of retroreflection (N Johnson, USA)	The TC document is mostly finished. Some data are to be included in the document. The chairman planned to send the final draft for TC voting by Warsaw Session. Further TC meetings were not planned.
2-23 Photometry of street-lighting luminaires (G Vandermeersch, Belgium)	Work was to be started by the chairman after completion of the work of TC2-10. No report on further progress so far.

2-24 Users Guide for the selection of illuminance meters (K Ganesha, India)	The chairman prepared a draft outline but needs some data to be collected from the users at large. He has prepared a questionnaire for wide circulation and has been mailing this along with a brief note on the need for the guidelines, a copy of a paper presented by him in the ISLE Symposium in New Delhi in Jan. 1997. The program was intended to proceed according to a strict time schedule requesting every member to respond by a given date. The chairman hoped to complete this work by the Warsaw Session.
2-25 Calibration Methods and Photoluminescent Standard for Total Radiance Factor Measurement (J Zwinkels, Canada)	The TC last met May 6, 1999 in Vancouver, in conjunction with the Inter-Society Color Council meeting. Five TC members and 2 observers were in attendance. The eighth draft of the TC report was distributed and discussed. Figures have been added and equation, table and figure numbering have been edited to conform with CIE guidelines. Remaining action items are some minor revisions to the text and to re-group the references at the end of the document. The revised document (ninth draft) will be circulated for TC ballot.
2-28 Methods of characterizing spectrophotometers (J Verrill, UK)	The third draft was circulated to TC members in April 1998. The text completed by the chairman and figures and references have been added. It is expected that there will be one more draft before voting and then a 5th draft for the vote, which should be completed before Warsaw.
2-29 Measurement of detector linearity (T Goodman, UK)	A brief TC meeting was held on 18 May 1998 to summarize current status and request additional inputs by the end of June in order for the third draft to be prepared for circulation in early November. Comments on the third draft were to be requested by the end of the year.
2-30 Diode-array radiometry J Palmer (USA)	The previous chairman, Wychorski, has resigned due to his increasing work load. But, he was present at the Boulder Division meeting, and gave a report. The document is currently the 4th draft, having 78 pages in 3 sections. None of them is copyrighted. A small part of the document is not complete. There is also a separate database file with about 800 entries of references. This data base is copy-righted, and payment is needed for use. About 1/3 of the references are in the written document which is not copy-righted.. There were discussions, and Div.2 agreed to publish the document in the CIE Collection at the end of the year.After the D2 meeting, James Palmer (Univ. Arizona, USA) agreed to take over the chairmanship to finish up the document for publication.

2-32 Measuring retroreflectance of wet horizontal road markings (Hodson, USA)	A chairman, Hodson, has taken over the TC. The TC met on May 18th 1998 in Boulder with 11 participants. The partial draft document was distributed and discussed. The TC is looking for new members who have expertise in rain simulation and visibility pavement marking. The TC planned to meet again in October 1998 in conjunction with the Div. 4 meeting in Bath, England, hopefully to attract Div.4 people. The TC also planned to meet in Warsaw in 1999.
2-36 CIE standard for V(λ) and V'(λ) (K Mielenz, USA)	There was a problem of the document status interfering with the competence of CCPR. Sauter had a discussion with the CCPR president, and in January 1998, sent to the chairman suggested changes to the document to solve this problem. The chairman is working to revise the document, once again, to respond to Sauter's comments as well as many other comments he received from other members. The document will go through a further vote.
2-36 Revision of CIE publication 54: retroreflection (J Rennilson, USA)	There was a TC vote on the 11th draft, but a 12th draft was prepared and voted on again. It is hoped that the TC meeting in Warsaw will be the final one.
2-37 Photometry using detectors as transfer standards (Y Ohno, USA)	The TC had a short meeting in Boulder with 38 participants including 13 members. The fifth draft was distributed and discussed. The new draft was previously distributed to the members in April. The draft is complete except for correcting some wording and bringing consistency in usage of a few terms. The $_{0}$ issue will wait for an advice from the CCU. The chairman planned to send out the sixth draft for the TC ballot before Warsaw.
2-39 Geometric tolerances for colorimetry (D Rich, USA)	The Committee met for the fourth time on May 18th 1998 in Boulder. Four Committee members and six guests were present.Tthe chairman was to prepare a draft of the final report and distribute the draft to committee members for comment. NIST and 3M have volunteered to supply some measurement data on standard materials to verify the effect of tightening the tolerances. The TC planned to meet at Warsaw in 1999.
2-40 CIE standard: Characterizing the performance of illuminance and luminance meters R Rattunde (Germany)	The TC had a successful meeting in Boulder with 35 participants. It discussed the second draft which was circulated in March 1998. There were active discussions with many comments from the attendees. The TC added some new members. The chairman requested the attendees to send further comments on the draft within a few months. A third draft was to be prepared for discussion at Warsaw Session.
2-41 Industrial photometry in developing countries. B Bhattacharya (India)	No report received from the chairman at the Boulder meeting. This TC was established in 1995. If no progress is made by the 1999 D2 meeting, this TC may be closed.

2-42 The colorimetry of visual displays A Hanson (UK)	An outline of the structure of the proposed report was discussed a the Expert Symposium on Color Standards for Imaging Technology in Scottsdale in Nov. 1997. The chairman is also taking care to coordinate the work of this TC with activities in the IEC.
2-43 Determination of measurement uncertainties in photometry G Sauter (Germany)	The TC met for the first time in Boulder with about 35 participants. The first draft, distributed in April, was discussed. There were active discussions on the structure of the document. There were suggestions for the document to start with a part with more plain descriptions for photometry practitioners, followed by the rigorous mathematical procedures as given in the current draft. Based on the discussions, the next draft will be prepared for the second meeting in Warsaw. The minutes of the TC meeting was distributed by e-mail on June 25, 1998.
2-44 Vocabulary matters. J Moore (UK)	A letter is being sent to members asking them to give their views on changes that they would like to see made to existing definitions in the International Lighting Vocabulary and on new terms that should be introduced. The new ILV will certainly incorporate the new definitions agreed by Division 2 which appear in the CIE Collection on Photometry and Radiometry, Publication CIE 114-1994. These include precise new definitions for distribution temperature and ratio temperature as well as the terminology relating to non-selective detectors.
2-45 Measurement of LEDs - Revision of CIE 127 K Muray (USA)	Had a TC meeting in Gaithersburg, Maryland, USA, on May 3, 1999. First draft (partial) was presented and discussed.
2-46 CIE/ISO standard on LED intensity measurements J Scarangello (USA)	Had a TC meeting in Gaithersburg, Maryland, USA, on May 3, 1999. First draft was presented and discussed.
2-47 Characterisation and calibration methods of UV radiometers G Xu (Singapore)	Established at the Boulder meeting. Approved by Board in 6/98.
2-48 Spectral responsivity measurement of detectors, radiometers and photometers G Eppeldauer (USA)	Established at the Boulder meeting. Approved by Board in 6/98.
2-49 Photometry of flashing lights Y Ohno (USA)	Established at the Boulder meeting. Approved by Board in 6/98.

7. REPORTERSHIPS IN PROGRESS

TITLE	STATUS
2-05 Visual Gloss J Taylor (UK)	Work is underway in several countries on the measurement of 'appearance' and a watching brief is being kept to see whether the situation changes. The reporter is to get information from NIST and ASTM subcommittee on appearance: E12-14.
2-06 Standardization of Measuring Geometry for the Colorimetry of Metallic Coatings C McCamy (USA)	The reporter presented the current status at the Boulder meeting. No need for a TC yet.
2-09 Absolute Cryogenic Radiometers A Parr (USA)	Many national labs now use cryogenic radiometers. In the U.S., they are used also by commercial sector for space applications. There is a need for a guide on utilization of these devices. The reporter is starting to think about a new TC. A longer report will be prepared for Warsaw with a proposed TR and an outline of the document.
2-21 Use of detectors as absolute transfer standards for spectroradiometry N Fox (UK)	New techniques are being investigated at NPL and elsewhere, but are not yet sufficiently well-developed to warrant establishment of a TC. The situation will continue to be monitored.
2-22 Implementation of Photometric Units R Köhler (BIPM)	This reportership was established in 1997 to study the need for a document to guide future implementation of photometric units for non-V(λ) functions. This was proposed by Moore in Durban, but Div. 2 did not decide to establish a TC then. The reportership is continued for the time being to watch the situation, contacting Div. 1 also.

8. DIVISION WEBSITE AND COMMUNICATIONS

During the quadrennium the Division website was expanded to the extent that most Division documents, reports, membership lists, contact details and circulars are readily available to Division members worldwide at any time. The web site is hosted on the webserver of the National Metrology Laboratory (NML) of South Africa at

http://nml.csir.co.za/~cie2

The high quality of communications with Division members and the website development are mainly due to the commitment and hard work of the Division secretary, Dr Yoshi Ohno, without whose input the Division could not have maintained the level of activity it achieved.

F Hengstberger (Division Director) June 1999